

## PROTECTIVE CASING FOR ELECTRICAL EQUIPMENT

### **FIELD OF THE INVENTION**

The invention relates to protective casing for electronic equipment, particularly for electrical equipment which is required to be deployed in hazardous environments, for example toxic or potentially explosive environments.

### **BACKGROUND TO THE INVENTION**

Certain minimum standards apply to electrical equipment for use in hazardous environments, for example electrical apparatus for use in potentially explosive environments is regulated in the European Union (EU) by EU standards BS EN 50018, BS EN 50016 and BS EN 50020, and in the United States by US standards UL 1203, US 913 and UL 6500. Similar standards apply to electrical apparatus for use in toxic environments, such as inside chemical and petroleum tanks. *Inter alia* these standards specify a minimum impact force which an electrical apparatus must be able to withstand.

Previously it has proved difficult and expensive to provide protective casing for electrical apparatus for use in hazardous environments, which casing simultaneously meets the requirements of all applicable standards.

### **OBJECT OF THE INVENTION**

The invention seeks to provide an improved protective casing for electronic equipment which mitigates at least one problem associated with the prior art.

### **SUMMARY OF THE INVENTION**

According to the present invention, there is provided a protective casing, in which a protective cage comprising an annulus surrounds a main body portion of the casing, and at least two spoke members attach the annulus to the main body portion.

In particular there is provided a protective casing for electrical equipment, the casing comprising a main body portion adapted to receive the equipment, and having a protective cage comprising at least one annulus surrounding the main body portion, and at least two spoke members attaching the annulus to the main body portion.

To provide enhanced impact protection for a relatively small additional weight and cost penalty, the cage may comprise two like annuli which surround the main body portion at different longitudinal positions along the main body portion, which define substantially parallel planes and which are attached to the main body portion by at least two common spoke members.

Preferably the or each annulus is circular in shape, providing for simpler manufacture and allowing the casing to roll on a flat surface.

If the or each annulus has a length in a dimension parallel to the length of the main body portion equal to approximately 10% of the length of the main body portion, good impact protection is provided but the overall weight of the casing is not excessive.

Preferably the or each annulus, and the main body portion, are welded to the spoke members as this provides a particularly strong casing.

To provide still further impact protection, casing of the invention may comprise two or more protective cages.

To provide still further impact protection, the spoke members and the, or each, annulus, may be arranged to be resiliently flexible.

Preferably the or each annulus is attached to the main body portion by three or more spoke members in order to give enhanced rigidity to the one or more protective cages.

The preferred features may be combined as appropriate, as would be apparent to a skilled person, and may be combined with any of the aspects of the invention.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

An embodiment of the present invention is described below, by way of example only, with reference to the accompanying drawings in which:

Figures 1 is a side view of a protective casing of the invention for a video camera which is intended for deployment inside chemical tank;

Figure 2 is a perspective view of the Figure 1 casing; and

Figure 3 is a longitudinal cross-section through the Figure 1 casing, the plane of the section being substantially a diametrical plane through the casing.

### **DETAILED DESCRIPTION OF INVENTION**

Referring to the Figures, a protective casing, according to the invention, for a video camera intended for deployment inside a hazardous chemical tank is indicated generally by 10. The casing 10 comprises a main body portion having first 12 and second 14 co-axial cylindrical sections which, as indicated in Figure 3, incorporate hollow enclosures 13, 15 for receiving a video camera. The cylindrical sections 12, 14 are formed of stainless steel 316 S11, for example. The casing 10 further comprises first 16 and second 17 end caps for sealing the main body portion after a video camera has been inserted so as to occupy the enclosures 13, 15. End cap 16 incorporates a connector on its exterior to allow video data to pass from the camera, through the casing 10, to a remote location. End cap 17 incorporates a glass window (not shown) enabling light to pass through the casing 10 to the video camera (not shown).

The casing 10 further comprises first 18 and second 20 protective cages attached to and surrounding the exterior of cylindrical sections 12 and 14 respectively.

Cage 18 comprises a substantially circular metal annulus 18A having an internal diameter greater than the external diameter of the first cylindrical section 12 of the casing 10, and is fixed to cylindrical section 12 by two or more spoke members 18S which are TIG welded thereto.

Protective cage 20 comprises two substantially circular metal annuli 20A, 20B surrounding the exterior of the cylindrical section 14 and TIG welded thereto by at least two common spoke members 20S. The annuli 20A, 20B each have an internal diameter greater than the external diameter of the second cylindrical section 14, and are parallel and separated by a distance approximately equal to the length of the cylindrical section 14.

The annuli 18A, 20A, 20B and the spoke members 18S, 20S are resilient, allowing shock absorption, and hence a reduced risk of damage to the video camera, if the casing 10 is dropped onto a hard surface.